



Biorenewable Insights: Isobutylene

Isobutylene is one in a series of reports published as part of NexantECA's 2016 Biorenewable Insights program.

Overview

Isobutylene is an important chemical intermediate for gasoline additives, polymers, and a variety of other commercial products. In 2015, approximately 15 million tons of isobutylene were produced globally from petrochemical feedstocks. In an effort to produce isobutylene more sustainably, several companies have developed routes to isobutylene that rely on bio-based feedstock sources like corn and sugar cane. These technologies are not yet commercially competitive as a result of the current environment of low oil and petrochemical feedstock prices. However, as the technology advances and oil prices increase, these routes could become competitive and begin to penetrate the market.

Fossil fuel-derived hydrocarbons and petrochemical intermediates are the conventional raw materials for fertilizers, chemicals, plastics, and fuels for transportation, power generation, cooking, and space heating, as well as for components of durable goods such as clothing and furniture. However, in an environment of volatile crude oil prices, concerns are mounting about the economic, environmental, and social risks of the world's reliance on non-renewable fossil hydrocarbons. Consequently, some of the world's biggest players in the energy and petrochemical industries are seeking to develop new feedstocks and products derived from bio-based materials.

Environmental and sustainability issues have become mainstream concerns in both the public and private sectors as a result of petrochemical feedstock price uncertainty and growing global concerns about climate change and environmental impact. This has helped generate a broad popular base of support for the development of bio-based fuels, feedstocks, chemicals, and renewable plastics. Isobutylene is an important product as a precursor to gasoline additives, rubber products, plastics, and a variety of other value chains.

Technologies

This report analyzes several routes to biobased isobutylene. These include:

- Gevo's Production of bio-isobutanol Followed by dehydration
- Ethanol to isobutylene Catalytic Conversion
- Global Bioenergies' Direct Fermentation
- Other Developmental Routes

Process Economics

Cost of production models for USGC, Brazil, Western Europe and China are shown for:

- Global Bioenergies Direct Fermentation from Sugar
- Gevo Fermentation to Isobutanol and Dehydration
- Ethanol to Isobutylene Catalytic Conversion

Capacity

NexantECA catalogues existing and planned isobutylene capacity and provides profiles of projects.



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The BI program (sister program to the world renowned TECH program, formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging technologies of interest to the renewable energy and chemical industries.

BI's comprehensive studies include detailed technology analyses, process economics, as well as capacity analysis and impacts on conventional industry. Reports typically cover:

- Trends in technology
- Strategic/business overviews and/or developer profiles
- Process Technology:
- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Capacity tables of plants and analysis of announced capacities
- Regulatory and environmental issues where relevant

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- Consultation time with the project team

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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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